WHAT IS CLAIMED IS:

1. A method of decoding a multidimensional symbol, the method comprising the steps of:

receiving a signal vectors $\mathbf{y}_1 \ldots \mathbf{y}_k$ into a sub-optimal decoder and generating an estimated transmitted multidimensional symbol $\tilde{\mathbf{S}}$ therefrom;

decoding the estimated transmitted symbol vector $\tilde{\mathbf{S}}$ via hierarchical subset decoding and determining a subset therefrom;

generating a reduced search space V associated with the subset; and

decoding $\mathbf{y}_1 \ldots \mathbf{y}_k$ via minimum distance decoding in order to obtain one of the following: the estimated transmitted multidimensional symbol $\hat{\mathbf{S}}$, soft bit information, hard bit information.

2. The method according to claim 1 wherein the step of generating a reduced search space V via the minimization of some metric d.

3. The method according to claim 1 wherein the step of generating a reduced search space V associated with the subset comprises generating a reduced search space by minimizing a metric d corresponding to the subset prior to generation of the subset.

4. The method according to claim 1 wherein the step of receiving signal vectors $\mathbf{y}_1 \ldots \mathbf{y}_k$ into a sub-optimal decoder and generating an estimated transmitted multidimensional symbol $\tilde{\mathbf{S}}$ therefrom comprises receiving a signal vector $\mathbf{y}_1 \ldots \mathbf{y}_k$ into a sub-optimal decoder and generating soft bit information therefrom.

5. The method according to claim 1 wherein the step of decoding the received signal vectors $\mathbf{y}_1 \ldots \mathbf{y}_k$ via minimum distance decoding using the reduced search space V and generating a multidimensional symbol $\hat{\mathbf{S}}$ therefrom comprises decoding the received symbol vectors $\mathbf{y}_1 \ldots \mathbf{y}_k$ via minimum distance decoding using the reduced search space V and generating a multidimensional symbol $\hat{\mathbf{S}}$ therefrom.

6. The method according to claim 1 wherein the step of receiving signal vectors $\mathbf{y}_1 \ldots \mathbf{y}_k$ into a sub-optimal decoder and generating an estimated transmitted multidimensional symbol vector $\tilde{\mathbf{S}}$ therefrom comprises receiving signal vectors $\mathbf{y}_1 \ldots \mathbf{y}_k$ into an interference cancellation decoder and generating an estimated transmitted symbol vector $\tilde{\mathbf{S}}$ therefrom.

7. The method according to claim 6, wherein the interference cancellation decoder is selected from the group consisting of a successive interference cancellation decoder, and a parallel interference cancellation decoder.

8. The method according to claim 1 wherein the step of receiving signal vectors $\mathbf{y}_1 \ldots \mathbf{y}_k$ into an unordered linear decoder and generating an estimated transmitted multidimensional symbol vector $\tilde{\mathbf{S}}$ therefrom comprises receiving signal vectors $\mathbf{y}_1 \ldots \mathbf{y}_k$ into a suboptimal decoder and generating an estimated transmitted symbol vector $\tilde{\mathbf{S}}$ therefrom.

9. The method according to claim 8, wherein the unordered linear decoder consists of a decoder selected from the group consisting of a zero forcing decoder, a MMSE decoder, and a matched filter receiver.

10. The method according to claim 1, wherein the multidimensional transmitted symbol $\hat{\mathbf{S}}$ is represented by the relationship $\hat{\mathbf{S}} = \arg\min_{\mathbf{v}\in V} m(\mathbf{y}_1,...,\mathbf{y}_k,\mathbf{v})$, and wherein m is any metric.

11. The method according to claim 1, wherein the step of decoding the estimated transmitted symbol vector $\tilde{\mathbf{S}}$ via hierarchical subset decoding and determining a subset therefrom comprises the steps of:

defining a hierarchical subset as an ordered set of subsets that cover a multidimensional constellation, wherein the hierarchical subsets are ordered such that if Hk and Hn are coverings of the constellation, and k<n, then union (Hk, Hn)=Hk; and

decoding the received symbol over the covering Hk using a desired distance.

12. The method according to claim 11, wherein the desired distance comprises the Euclidean distance of the received vector from the center of each of the sets within Hk.

13. The method according to claim 11, wherein the step of decoding the received symbol over the covering Hk using a desired distance comprises the steps of:

returning a set Vk in Hk;

decoding to a subset V(j+1) in intersection (H(j+1), Vj) at the (j+1) stage of decoding;

terminating the hierarchical decoding when j is equal to a desired integer L; and

implementing ML decoding using VL as a reduced search space.